

(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関  
国際事務局



(43) 国際公開日  
2005年10月6日 (06.10.2005)

PCT

(10) 国際公開番号  
WO 2005/092817 A1

- (51) 国際特許分類: C04B 35/495, H01L 41/187  
(21) 国際出願番号: PCT/JP2005/003266  
(22) 国際出願日: 2005年2月28日 (28.02.2005)  
(25) 国際出願の言語: 日本語  
(26) 国際公開の言語: 日本語  
(30) 優先権データ:  
特願2004-091866 2004年3月26日 (26.03.2004) JP  
特願2004-248352 2004年8月27日 (27.08.2004) JP  
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(81) 指定国 (表示のない限り、全ての種類の国内保護が  
可能): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR,

/続き有/

(54) Title: PIEZOELECTRIC CERAMIC COMPOSITION

(54) 発明の名称: 圧電磁器組成物

材料 No.	組成成分		主成分 $Pb_{0.97-1.01}(Mn_{0.04-0.16}Nb_{0.04-0.16})_{0.97-1.01}Ti_{0.97-1.01}Zr_{0.03-0.04}O_3$ ( $x+y+z=1$ )				電気特性 $Q_{max}$	機械的強度 $\sigma_{cs}$ ( $N/mm^2$ )	耐熱性 $\Delta T_F$ ( $^{\circ}C$ )	Al含有相 Al含有相
	$Al_2O_3$ (wt%)	$SiO_2$ (wt%)	$x$ (mol)	$y$ (mol)	$z$ (mol)	$w$ (mol)				
1	0.1						120	155	0.11	x
2	0.3						125	172	0.07	○
3	0.5	0.01	0.99	0.10	0.53	0.37	135	179	0.08	○
4	0.7						130	182	0.07	○
5	1.0						133	182	0.07	○

A... SAMPLE No.  
B... MINOR COMPONENT  
C... MAIN COMPONENT  
D... ELECTRICAL CHARACTERISTIC  
E... MECHANICAL STRENGTH  
F... HEAT RESISTANCE  
G... AL-CONTAINING PHASE

(57) Abstract: Disclosed is a piezoelectric ceramic composition which is excellent in electrical characteristic  $Q_{max}$ , heat resistance and temperature characteristics of resonant frequency. This piezoelectric ceramic composition is characterized by comprising a phase mainly containing a lead zirconate titanate having a perovskite structure and an Al-containing phase. It is preferable for the main component of this piezoelectric ceramic composition to contain Mn and Pb and to have a chemical composition represented by  $Pb_{0.97-1.01}(Mn_{0.04-0.16}Nb_{0.04-0.16})_{0.97-1.01}Ti_{0.97-1.01}Zr_{0.03-0.04}O_3$  (wherein  $0.97 \leq \alpha \leq 1.01$ ,  $0.04 \leq x \leq 0.16$ ,  $0.48 \leq y \leq 0.58$ ,  $0.32 \leq z \leq 0.41$ ).

(57) 要約: 電気特性  $Q_{max}$ 、耐熱性、さらには共振周波数の温度特性のいずれもが優れた圧電磁器組成物を提供する。この圧電磁器組成物は、ペロブスカイト型構造を有するチタン酸ジルコン酸鉛を主成分とする相と、Al含有相を含むことを特徴とする。この圧電磁器組成物は、主成分がMn及びNbを含有すること、さらに主成分が  $Pb_{0.97-1.01}(Mn_{0.04-0.16}Nb_{0.04-0.16})_{0.97-1.01}Ti_{0.97-1.01}Zr_{0.03-0.04}O_3$  (ただし、 $0.97 \leq \alpha \leq 1.01$ 、 $0.04 \leq x \leq 0.16$ 、 $0.48 \leq y \leq 0.58$ 、 $0.32 \leq z \leq 0.41$ ) の組成

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BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:

— 国際調査報告書

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE,

2文字コード及び他の略語については、定期発行される各PCTガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/003266

A. CLASSIFICATION OF SUBJECT MATTER  
Int. Cl.<sup>7</sup> C04B35/495, H01L41/187

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
Int. Cl.<sup>7</sup> C04B35/00-35/50

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005  
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
CA (STN), REGISTRY (STN)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2000-327419 A (Murata Mfg. Co., Ltd.), 28 November, 2000 (28.11.00), Claims; table 1 & US 6299791 B1	1-16
Y	JP 2000-103674 A (Matsushita Electric Industrial Co., Ltd.), 11 April, 2000 (11.04.00), Claims; Par. Nos. [0013] to [0030] (Family: none)	1-16
Y	JP 2002-316871 A (Murata Mfg. Co., Ltd.), 31 October, 2002 (31.10.02), Claims; Par. Nos. [0034] to [0037]; table 1 (Family: none)	1-16

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search  
25 April, 2005 (25.04.05)

Date of mailing of the international search report  
17 May, 2005 (17.05.05)

Name and mailing address of the ISA/  
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/003266

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-60269 A (Murata Mfg. Co., Ltd.), 26 February, 2002 (26.02.02), Claims; Par. Nos. [0020], [0021]; table 2 & US 2002-41132 A1	1-16
Y	JP 2002-308672 A (Murata Mfg. Co., Ltd.), 23 October, 2002 (23.10.02), Claims; Par. No. [0023]; table 2 & US 2003-96696 A1	1-16